

AMATEUR SATELLITE REPORT

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Keplerian Elements To Be Transmitted On UO-11 DCE

As previously planned, UO-11 will soon begin providing Keplerian elements in error-checked Digital Communication Experiment (DCE) message titles, rather than through the On Board Computer (OBC) Bulletin. Message titles will be transmitted periodically when the DIARY switches the DCE to the downlink. Moving the Keplerian elements to the DCE fulfills two common UoSAT user requests, namely:

- 1) Since the Keps will not be taking up OBC memory, there will be more room for news items in the Bulletin.
- 2) Each element set will be sent with error checking information, allowing you to confirm that you have received the elements correctly.

Details of the format of DCE title frames have been published in UoSAT bulletins, OSCAR NEWS and in the Proceedings of the ARRL Fifth Computer Networking Conference. ASR #151 will carry the format in case you missed it in one of the other publications. Jeff Ward, GØK8KA at Surrey has developed a Keplerian capture program for the BBC microcomputer which will be made available as soon as it has been tested. If you do not want to error check the elements, they are in ASCII and can be received by your current UoSAT receiving setup WITHOUT MODIFICATION.

To fit a complete element set within a single, 80-character line, the number of digits sent for each element has been reduced to the minimum essential commensurate with adequate levels of precision. That is, the number of significant digits provided for each of the elements provided in the new format differs from the traditionally transmitted format. James Miller, G3RUH, has been instrumental in recommending the appropriate levels of precision for each element.

Semi-major axis, SMA, is a required input to some programs. It is not provided in the new DCE set since it is easily calculated from mean motion. The equation is:

$$SMA = 42220 * (\text{Mean Motion})^{-2/3}. \text{ The units are kilometers.}$$

Space Remains A Risky Business: A Capsule Summary of Where We Are

Who would have predicted that most of the world's major launch systems would be on hold because of accidents or incidents? And yet that's precisely what's happened. With the Soviet Proton failure added to the grounding of Shuttle, Ariane, Titan and Atlas, one is left to wonder if we expected too much.

Editorial Opinion by WA2LQQ

It now appears the Soviet Union has experienced another major launch failure. This comes on the heels of continuing difficulties with the Ariane program of the European Space Agency and the well-publicized trauma



Tom Gentry, K5VOU, left, answers the proverbial question "Where is OSCAR?" Tom's company, ENCOMM has developed an autotrack system based (with permission) on AMSAT's QUIKTRAX program. Greg Sands, N4KJB, watches at the Miami convention.

having befallen the United States' recent space efforts. A picture is emerging of a continuing risky business far, far from the "space truck"-like business the public was led to believe was just around the corner.

According to Aerospace daily, a Proton launcher, probably the largest operational launcher in the huge Soviet inventory, failed in late April. According to the newspaper, the upper stage apparently failed placing the ill-fated payload in an unusable orbit. It was apparently designed for a Molniya orbit. Sources suggested the payload was either COSMOS 1838, one of a series of GLONAS navigation satellites or COSMOS 1839. The payload has been deposited in a low orbit inclined 62.8 degrees. This inclination is characteristic of a Molniya orbit.

Meanwhile, no further word has been received concerning plans for stemming the schedule slippages on ESA's Ariane program. As reported recently, the V-19 mission has again been delayed due to a further testing incident at SEP, Vernon, France. The original V-19 third stage engine was damaged in a vacuum chamber handling incident several weeks ago. The third stage formerly destined for the V-20 launch was brought forward to replace the damaged engine. However, the replacement engine was itself severely damaged when a turbopump bearing overheated three weeks ago. Consequently, the V-19 launch now appears to be sliding out of the summer launch period with further movement possible. No launch date for V-19 has been published by Arianespace.

Evidence is now accumulating that the recent failure of a U.S. Atlas Centaur launcher from the Kennedy Space Center March 26 was in fact caus-

ed by lightning as had been speculated immediately after the incident. Debris recovered from the Atlantic, especially the recovered fairing, showed numerous holes entirely consistent with lightning damage according to *Aviation Week and Space Technology* magazine. The Atlas, a 25 year veteran of the U.S. launcher fleet, among the most reliable in the world, was launched into the boundary areas of a severe thunderstorm. NASA officials emphasized that the then extant conditions were within allowable launch constraints since observations showed the nearest lightning strikes were miles away. A Congressional Committee has strongly suggested those launch criteria be re-evaluated under the circumstances.

Finally, a recent edition of *The Institute*, a publication of the Institute of Electrical and Electronic Engineers (IEEE) says the major contributing cause of the shuttle Challenger catastrophe was upper level wind shear which served to exacerbate the O-ring separation problem. It said evidence of unanticipated high forces has surfaced in review of the records of prior SRB recoveries which showed large bolts had been sheared near the SRB nozzle. Analysts had previously attributed this finding to the force of impact when the SRBs hit the water. They are now looking at this finding in a new light, the article in the Institute said.

The suggestion could lead to a revision in the Roger's Commission finding that the explosion which convulsed Challenger 15 months ago began when the aft attach point broke causing the tip of the SRB to swivel into the tank rupturing it. The new scenario may suggest the explosion began close to the aft portion of the SRB adjacent to the failed SRB joint when extremely high wind shear levels opened the field joint allowing high temperature gases to penetrate the liquid propellant tank. The implication of this new theory, based in large measure on analysis of high-speed photographic evidence, is unclear at this juncture. One thing which seems certain, however, is that the return of the space shuttle will not be expedited by this news. Meanwhile, the Federal Bureau of Investigation has been called in to look into charges of fraud on behalf of Morton-Thiokol, the SRB manufacturer, filed by several former Thiokol employees.

Getting men and equipment into space is still far, far from the routine procedure many had thought it would be when the U.S. space program was at its height in the late Sixties and early Seventies. Perhaps we have expected too much in the way of a space transport system. It is quite clear that our path into orbit and eventually to the planets and beyond, if measured by recent history, is a much more tortuous trek than any would have imagined merely a decade ago.

Plans Call For AO-10 Return To Service On May 15

Spacecraft controllers have tentatively concluded operations on AMSAT OSCAR 10 may commence on May 15. This view is based on tests performed between May 1 and May 8. The tests indicated sun angles were improving and operations probably should commence on May 15.

But several factors added a note of caution to the command team's assessment. Of particular concern was the rapid fall of bus voltage when the spacecraft enters eclipse near perigee. According to ZL1AOX, this could mean several things. For one, it could mean the Battery Charge Regulator (BCR) level is incorrectly set. Unfortunately, BCR levels are under software control and are not easily changed given the IHU situation. Another possible cause for the low bus voltage is unauthorized use of the satellite in the last couple of weeks.

Commencement of operations was postponed from May 1 to May 15. However, a number of stations apparently were uninformed and heavily loaded the transponder during this period. This is unfortunate because it has adversely affected battery charging. Also, unauthorized use has made more difficult the task of assessing battery condition. If AO-10 life is to be extended, improved user attention to condition reports and operating advisories is essential.

The precise spacecraft attitude is also an open question at present. Estimates of the attitude are critical to proper scheduling and to extending spacecraft life. You can help determine the attitude with some rather simple measurements made by observing the beacon. According to

G3RUH, all you need do is observe the beacon for a few orbits and report your findings. G3RUH will collect the observation reports and make the calculations necessary to determine the attitude.

Monitor the beacon through a pass and note the time when the spin modulation seems to disappear and when it seems to reappear. This will occur roughly between MA 20 and 90. Keep your station configuration constant. That is, change only the az/el of your tracking antennas while leaving unchanged all other equipment settings. Then forward to G3RUH the date/times (in UTC) of your observation and your geographic coordinates in latitude and longitude. More than one orbit would help too; say one or two orbits per week for three weeks. Mail to James Miller, G3RUH, 3 Benny's Way, Coton, Cambridge, CB3 7PS, England. This way you can actually help in spacecraft operations planning by helping to refine estimates of spacecraft attitude.

The following tentative operating schedule has been suggested for AO-10 beginning May 15. Operations shall be authorized beginning May 15 from Mean Anomaly 30 through 220 subject to further refinement later. Unless modified later because of transponder overloading, this schedule will remain in effect until the end of June.

If FMing of the beacon or passband signals is observed, all operations must cease at once. Continuous carrier modes such as RTTY, SSTV and FAX are prohibited. QRO operation can be very damaging and is strongly discouraged. One way to discourage over-power operation is to not engage any QRO station in a QSO.

Please stay in tune with official bulletin sources for any last minute changes to these tentative plans. Bulletins are carried on the AMSAT nets and specific operational guidance is being carried by W1AW of the ARRL and GB2RS of the RSGB.

Short Bursts

- Ariespace is about to announce its plans to resume launches of the Ariane rocket according to official sources. The launch manifest and schedule will be key to AMSAT's planning for the next several months. Phase 3C, manifested aboard the first Ariane 4 flight, V-21, could be launched as soon as November, 1987. A spring, 1988 launch is more likely sources indicate, however.
- AMSAT DL has released preliminary plans for a new Phase 3 satellite, Phase 3D. It would be a scaled-up version of Phase 3C with a very powerful (250 watt PEP) Mode JL transponder aboard. Weighing 400 kg at launch, the satellite would be launched to a Molniya orbit in the 1990-1991 time frame according to AMSAT DL.
- The 1987 AMSAT Space Symposium and Annual Meeting will be held November 7 at the Southfield (Michigan) Hilton Hotel. Astronaut Dr. Tony England, WØORE, will be the featured speaker. Tony is U.S. Space Station Program Scientist and a member of AMSAT's Phase 4 Satellite Program Team: The major banquet prize for this year has been donated by ICOM and is the brand new ICOM IC-475A all-mode 70 cm transceiver. Details to follow.
- AMSAT Headquarters announces the kick-off of the 1987 member recruitment program. The program will run from May 15 through October



Top prize in AMSAT's 1987 Member Recruitment contest is this new ICOM IC-275A 2 meter all-mode transceiver. (Donated by ICOM).

15, 1987. Numerous prizes will be awarded to the AMSAT members who bring in the most new annual members or annual member renewals. Top prize will be the new ICOM IC-275A all-mode 2 meter transceiver donated by ICOM to spur AMSAT membership. Complete details will be announced shortly. Meanwhile, you should send an SASE to AMSAT HQ for a copy of the rules and membership application blanks. Send your SASE to: AMSAT, P.O. Box 27, Washington, D.C. 20044

- The OSCAR/AMSAT archives is looking for "back issues" of the *AMSAT Newsletter*. Issues prior to Volume XII are needed to complete the archive sets. Please contact the OSCAR/AMSAT Archives, c/o Project OSCAR, Inc., P.O. Box 1136, Los Altos, CA 94023-1136 Attn: WB6GJF).
- ARRL HQ has told AMSAT the software for the ARRL antenna controller system is now complete and in distribution. This software supports the hardware controller published previously in *QST* and which is currently available in kit form from an outside supplier.
- The formative meeting of AMSAT International has been postponed until 1988 to allow for more preliminary discussions and preparations to be made.
- Some older C-64 QUIKTRAK diskettes may have minor problems. If you think you may have a problem, please return the diskette to the AMSAT Software Exchange at AMSAT HQ. Please do not return the diskette to Paul Beeman, KA2MUM, as Paul is no longer doing the software for the Software Exchange.

MIR EVA Postponed

The Soviet news agency TASS has announced the Mir Cosmonauts Extra Vehicular Activity, the EVA or space walk, intended to install additional solar panels, has been postponed. Originally the solar panels were to have been installed before Progress 29 was launched and docked to the KVANT module. With the KVANT exit port clear, this would have allowed the Cosmonauts to take equipment such as the solar panels out the rear of KVANT, the astrophysics module.

Now, however, with the KVANT exit port blocked by the docking there of Progress 29, they must exit through the docking ball. The concern is that they may be unable to fit two men and equipment into the ball all at once. They may try opening up the TM-2 descent module, which is also docked to the docking ball, to allow a larger working and storage area. This would allow the crew and the equipment to be in the same area and then seal off the docking ball from MIR and the TM-2 descent module unit during the EVA.

Radio Moscow has said the crew was busy unloading Progress 29. This suggests another option may be under way. That is, to first unload P-29, jettison it by separating it from KVANT and then to revert to the original plan to exit with the solar panels through the then clear rear port of KVANT.

The new solar panels are required to bring MIR up to required power levels to support numerous power-intensive experiments on board.

FO-12 BBS Testing Begins

According to JR1FIG and JA2PKI, new FO-12 Mode JD software was released on May 4. Tak, JA2PKI, says the new mode allows "On Demand" operation of Mode JD, which means that the bird is usually in the listen mode and starts transmitting mode JD PSK signals on 435.910 MHz immediately after receiving any acceptable AX.25 frame including "UI" through one of four uplink channels, 145.85, 87, 89, or 91 MHz. It continues its operation as long as it receives AX.25 frames before three minutes have elapsed. The bird reverts to listen mode when it does not hear a AX.25 frame for more than 3 minutes.

This "On Demand" operation occurs while the bird is in "ON" period which occurs every other 2 hours. While the bird is in "ON" period, you will hear a 5 second PSK burst every minute so you will know mode JD is available and can be switched on by sending packets to it. You will hear nothing while it is in the 2 hour "OFF" period.



Dick Beers, WD9IIC, (ZF2FK) at the Hamvention.

This new mode will become the base of coming FO-12 BBS service and the digital repeater service. Weekly schedules will be determined after enough power usage data for this new mode has been acquired and analyzed. JAMSAT says they expect more than 4 days per week would be available for Mode JD operation if there were no Mode JA operation at all.

The first version of the BBS program which has a limited number of commands will be loaded and tested on FO-12 very soon. Please keep in mind that even though you may hear PSK beacons from the FO-12 BBS, it does not mean that the BBS is available for general use. While the software team is testing its functions, your attempt to connect to FO-12 (8J1JAS) might fail and receive BUSY from it.

The first version of the program would have following commands;

- F : List latest 10 message headers with message number
- F* : List all the message headers.
- R (n) : Read a message numbered (n)
- W : Send a message. You will be asked receiver and subject. Send (CR). (CR) or (CR) ^ (CR) to end the message
- K (n) : Kill a message numbered (n) A message being read by other station(s) cannot be killed. FO-12 BBS is a multi-user system. Only originator of the message can kill messages.
- H : Help.

Your TNC should be set as follows;

- Protocol : It have to be the version 2. WA8DED PROMs are needed for TNC-1.
- Command TNC-1 : V2
- TNC-2 : Ax2512v2 ON
- T1 timer : 6 seconds or longer
- Command TNC-1 : F6
- TNC-2 : FRack 6
- Max Frames : 2 or 3 is suggested.
- Command TNC-1 : O2 or O3
- TNC-2 : MAX 2 or MAX 3

Other operating notes provided by JAMSAT include:

1. Call sign of FO-12 which you use to connect is 8J1JAS.
2. The numbers of message are limited to 50. If more than 50 messages are posted, older ones will be overwritten. Maximum available memory as message storage is 192 KBytes.
3. There will be no command to logout. Simply disconnect by TNC's disconnect command.
4. No personal mail will not be supported by this first version. Your messages can be read by anyone and you can read messages addressed to someone else.
5. While BBS is in operation, digital repeater is disabled.
6. Digipeated packets will not be accepted by FO-12.
7. Increasing number of users will slow its response and require longer T1 time.
8. The maximum acceptable length of the data portion of a packet (PACLEN) is 199. It should be set shorter.
9. FO-12 transmits at PACLEN=128 and MAXFRAMES=1.

This information is preliminary and may be changed without notice.

UA3CR to Travel Polar Route Possibly With RS Hand-Held Transceiver

Communication via Amateur Radio satellites as well as the internationally operated SARSAT/COSPAS satellites will be a vital part of a joint Russian-Canadian polar skiing expedition next February according to PA0DLO and G3IOR. Leonid Labutin, UA3CR, well-known polar explorer and Radio Sputnik proponent, will be part of the group of Russian and Canadian scientists venturing across the North Pole late next winter.

Voice and data communications may be employed on the satellites. A new hand-held satellite communications transceiver was recently demonstrated in the Soviet Union and written up in the March 22 edition of Sovetskaya Rossiya. It is believed this is a low-speed data (perhaps packet) communications system that could probably be used with RS-9 after it is launched. (See ASR #149). According to G3YJO, preliminary discussions have been held concerning carrying a UO-11 DCE station with the expedition.

UA3CR is expected to attend the AMSAT UK Symposium this July at the University of Surrey according to Ron Broadbent, G3AAJ, AMSAT UK Secretary. It is anticipated UA3CR may provide some insight to the polar expedition plans and communications equipment suite at that time.

In related news, PA0DLO reports that according to UA3CR, the RS-9 telemetry format will be 32 analog channels and 16 binary status channels. Additional details are pending. Current estimates place RS-9 launch in the June time frame.

QEX Articles Feature Autotrack Systems, Techno-Sport Activities

An autotracking system to work from the parallel port of your RADIO SHACK TRS-80 model-100 lap-top computer and using a Kenpro KR-5400A rotor to point your antennas at a selected satellite is the lead story in the May QEX magazine. The article is by AMSAT member Frank Perkins, WB5IPM, of Arlington, Texas. Also included is a BASIC program listing for tracking FO-12 that can run in background allowing the model-100 to simultaneously function as a terminal interfaced to a TNC. Part 2 of the article will delineate how to use the system with your Kenpro KR-400 and KR-500 rotors.

Also in the May QEX is a fine summary of the Phase 4 System Initial Design Review held last month in Boulder, Colorado. The summary is written by Phase 4 Engineering Administrator Dick Jansson, WD4FAB.

QEX is for advanced experimenters and others interested in the leading edge of Amateur Radio Technology. It is published monthly and jointly by AMSAT and ARRL. AMSAT's QEX Editor Ron Long, W8GUS, is looking for good, meaty, technical articles to include in future editions of QEX. Among future articles already planned is a multi-part article on using OSCARs in the new Techno-Sport of radio location via satellite as is done using the SARSAT/COSPAS search and rescue satellites as well as some new techniques to be used on Phase 3C. Techno-sport also includes the popular ZRO Test for satellite station receive sensitivity.

QEX subscriptions are available through AMSAT Headquarters.

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The booth crew at the Miami Convention (l-r) George Kerly, WT4X; Mike Crisler, N4IFD; Rip, WA2LQQ; Dick Jansson WD4FAB; Greg Sands, N4KJB.

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